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The attached documents are exact copies of the European patent application described on the following page, as originally filed.

Les documents fixés à cette attestation sont conformes à la version initialement déposée de la demande de brevet européen spécifiée à la page suivante.

Patentanmeldung Nr.   Patent application No.   Demande de brevet n°

02080357.3

IB/03/5131

Der Präsident des Europäischen Patentamts;
Im Auftrag

For the President of the European Patent Office

Le Président de l'Office européen des brevets
p.o.

R C van Dijk

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Anmelder/Applicant(s)/Demandeur(s):

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Bezeichnung der Erfindung/Title of the invention/Titre de l'invention:
(Falls die Bezeichnung der Erfindung nicht angegeben ist, siehe Beschreibung.
If no title is shown please refer to the description.
Si aucun titre n'est indiqué se referer à la description.)

Dial based on audio position for presenting (numerical) data around user's head

In Anspruch genommene Priorität(en) / Priority(ies) claimed /Priorité(s)
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Staat/Tag/Aktenzeichen/State/Date/File no./Pays/Date/Numéro de dépôt:

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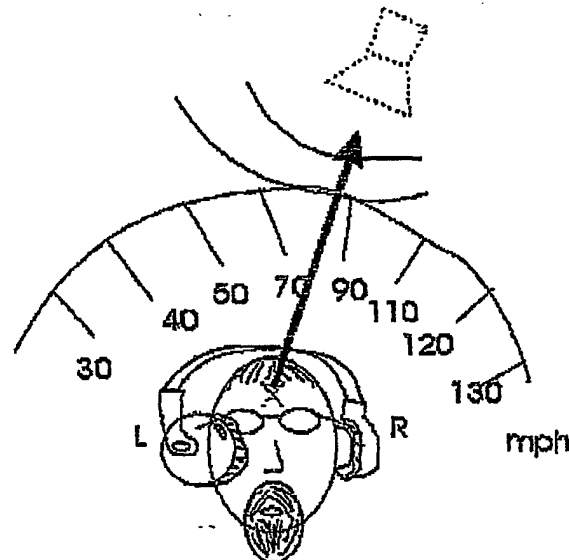filing/Etats contractants désignées lors du dépôt:

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Dial based on audio position for presenting (numerical) data around user's head

By means of HRTFmodeling and headphones it is possible to place a sound source in any position around a user's head. The HRTF models the transfer function of a (virtual) loudspeaker to an ear of a particular user. The HRTF can be measured with in ear headphones and a number of loudspeakers, and interpolated for intermediate positions (see e.g. EPP02079297.4 or WO0149066). Many devices/applications present numerical or nominal data (e.g. a clock, thermometer (30-45 deg), car electronics...). Usually this is on a alphanumerical display or dial. User's have to watch all these devices all the time, but this is not in all circumstances/applications desirable.

It is possible to create a virtual dial around the head of a user wearing headphones, and to use the sound image as pointer (e.g. Fig. 1). Two stand alone loudspeakers can also be used.

Many applications can be thought of which might benefit from this technology.

Consumer Applications are e.g.
- a jogger does not want to look at the wrist watch of his heart rate meter all the time and gets his heart rate as a projection of the music he is listening to while jogging
- an email comes in. Dependence on the importance of who sent it, a beep is added in a certain position to your music (while watching t.v. with headphone e.g./ or or behind p.c.)
- relaying information in the car

Professional applications are e.g.
- Fire department going into smoky corridors can hardly read dials. Different frequency beeps could represent different dials (e.g. 1 how closeby a fire hearth is, and one indicating base station or medical data)
- A surgeon operating might desire additional audio feedback (which he does not readily get from his staff, e.g. sensory data from his operating instruments, like force feedback) through small in-ear headphones. while still being able to fully concentrate on his work

The dials can be implemented vertically over the head, horizontally around it, or even a number of discrete classes in discrete locations. E.g.
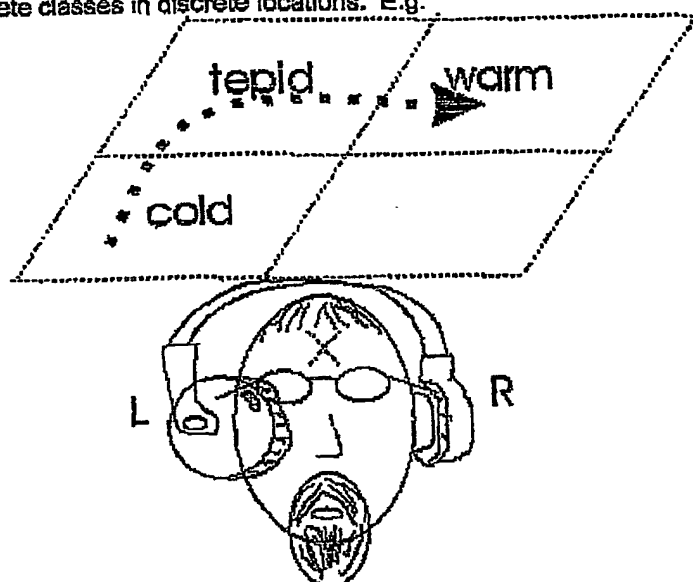

Fig. 2: Mapping three nominal thermometer values on a chess board pattern in a circular order. The order could also be zigzag e.g.
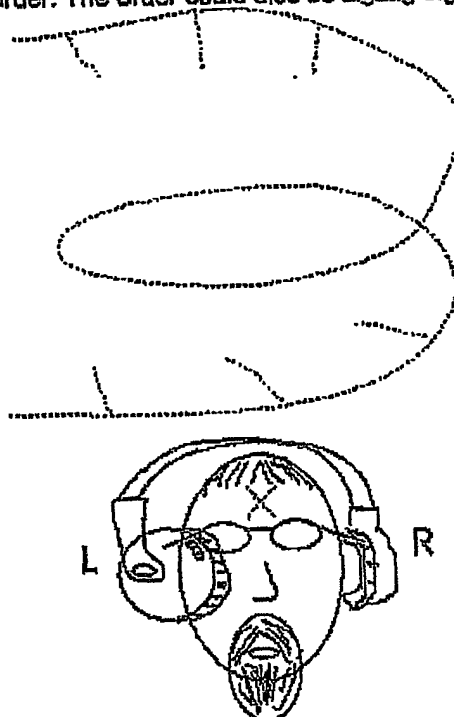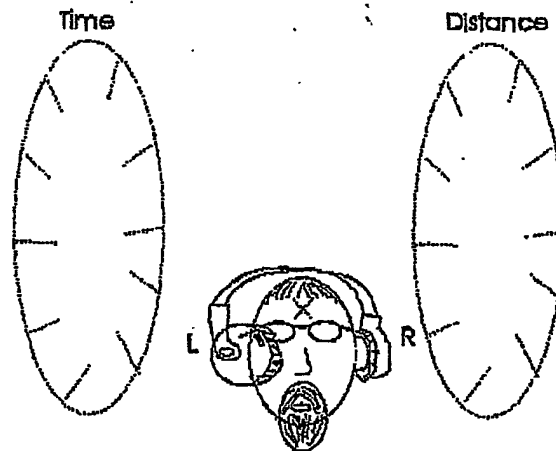

Fig. 3: Spiral dial. The distance can be simulated by making the sound softer.

Time   Distance

Example of providing two audible measurement displays simultaneously. One on the left and right of the user.

Data transfer between headphone and sensor/data device can be wireless e.g. via bluetooth or wired.

The sound can be e.g beeps.

The mapping can be done by any technique known from mathematics, between 1D axis and 3D sphere, cone, cilinder, plane, ... at certain position compared to the user's head. Two dimensional numerical entities can also be projected (e.g a geograpical map).

A system containing an audio reproduction apparatus with processing capability headphones, and a measurement device (e.g. heart rate meter) and a method of representing numerical data as a directional audio signal are also possible.

The key idea is:
- selecting an calculating a transformation from the MEASUREMENTS to a vritual space around a user's head (user interface for morphing a mapping may be incorporated, e.g on MP3 player, GSM, dashboard car , ...)
- performing audio processing so that at least at certain instances of time a sound source is perceived to originate form the required virtual location

CLAIM:

A user interface apparatus for presenting at least one measurement from a measuring device to a user,
characterized in that:
- a processor is included able to realize a mapping between the measurement coordinate axis and the space around the user's head;
- a source of an audio signal is present; and
- an audio signal processor is present capable of transforming the audio so that it appears to come from a particular point in space around the user's head corresponding to the mapping to space of the particular measurement.

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PCT Application
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